

PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference WPP80799	FOR FURTHER ACTION		see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.
International application No. PCT/GB 00/ 02168	International filing date (day/month/year) 05/06/2000	(Earliest) Priority Date (day/month/year) 04/06/1999	
Applicant TOSHIBA RESEARCH EUROPE LIMITED et al.			

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 3 sheets.
☒ It is also accompanied by a copy of each prior art document cited in this report.

1. Basis of the report

- a. With regard to the **language**, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.
- ☐ the international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).
- b. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international search was carried out on the basis of the sequence listing :
- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ the statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

2. ☐ **Certain claims were found unsearchable** (See Box I).

3. ☐ **Unity of Invention is lacking** (see Box II).

4. With regard to the title,

- ☒ the text is approved as submitted by the applicant.
- ☐ the text has been established by this Authority to read as follows:

5. With regard to the abstract,

- ☒ the text is approved as submitted by the applicant.
- ☐ the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. The figure of the drawings to be published with the abstract is Figure No.

- ☒ as suggested by the applicant.
- ☐ because the applicant failed to suggest a figure.
- ☐ because this figure better characterizes the invention.
- ☐ None of the figures.

INTERNATIONAL SEARCH REPORT

International Application No.
PCT/GB 00/02168

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 G01N21/35

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 G01N

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the International search (name of data base and, where practical, search terms used)

EPO-Internal, PAJ, WPI Data, INSPEC, COMPENDEX, IBM-TDB

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	<p>D.M. MITTLEMAN ET AL: "T-ray imaging" IEEE JOURNAL OF SELECTED TOPICS IN QUANTUM ELECTRONICS., vol. 2, no. 3, September 1996 (1996-09), pages 679-692, XP000689828 IEEE SERVICE CENTER., US ISSN: 1077-260X cited in the application abstract page 680, right-hand column, line 7 - line 19 page 685, left-hand column, line 1 -right-hand column, line 11 figures 2,9</p> <p style="text-align: center;">--- -/-</p>	1,2,25, 26

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents:

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier document but published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"A" document member of the same patent family

Date of the actual completion of the international search

19 October 2000

Date of mailing of the international search report

26/10/2000

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

Authorized officer

Thomas, R.M.

INTERNATIONAL SEARCH REPORT

Int'l Application No

PCT/GB 00/02168

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 0 828 143 A (LUCENT TECHNOLOGIES) 11 March 1998 (1998-03-11) column 1, line 14 - line 30 column 11, line 7 - line 44 figures 5A,5B ----	1,25
E	GB 2 347 835 A (TOSHIBA RESEARCH EUROPE) 13 September 2000 (2000-09-13) page 1, paragraph 1 page 38, paragraph 7 claim 39; figure 36 -----	1,2, 18-26, 30,32, 33,37-41

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/GB 00/02168

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 0828143 A	11-03-1998	US 5789750 A	04-08-1998
		JP 10104171 A	24-04-1998
GB 2347835 A	13-09-2000	WO 0050859 A	31-08-2000

PATENT COOPERATION TREATY

PCT

REC'D 14 SEP 2001

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PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference WPP80799	FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/GB00/02168	International filing date (day/month/year) 05/06/2000	Priority date (day/month/year) 04/06/1999
International Patent Classification (IPC) or national classification and IPC G01N21/35		
Applicant TERAPROBE LIMITED et al.		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.


2. This REPORT consists of a total of 9 sheets, including this cover sheet.

- ☐ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☒ Priority
- III ☒ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☒ Certain documents cited
- VII ☒ Certain defects in the international application
- VIII ☒ Certain observations on the international application

Date of submission of the demand 03/01/2001	Date of completion of this report 12.09.2001
Name and mailing address of the International preliminary examining authority:  European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized officer Feldhoff, R Telephone No. +49 89 2399 2186



INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/GB00/02168

I. Basis of the report

1. With regard to the **elements** of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17):*)

Description, pages:

1-30 as originally filed

Claims, No.:

1-43 as originally filed

Drawings, sheets:

1/12-12/12 as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
- ☐ the claims, Nos.:

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. PCT/GB00/02168

☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

II. Priority

1. ☐ This report has been established as if no priority had been claimed due to the failure to furnish within the prescribed time limit the requested:

☐ copy of the earlier application whose priority has been claimed.

☐ translation of the earlier application whose priority has been claimed.

2. ☒ This report has been established as if no priority had been claimed due to the fact that the priority claim has been found invalid.

Thus for the purposes of this report, the international filing date indicated above is considered to be the relevant date.

3. Additional observations, if necessary:

III. Non-establishment of opinion with regard to novelty, inventive step and industrial applicability

1. The questions whether the claimed invention appears to be novel, to involve an inventive step (to be non-obvious), or to be industrially applicable have not been examined in respect of:

☐ the entire international application.

☒ claims Nos. 42, 43.

because:

☐ the said international application, or the said claims Nos. relate to the following subject matter which does not require an international preliminary examination (*specify*):

☒ the description, claims or drawings (*indicate particular elements below*) or said claims Nos. 42, 43 are so unclear that no meaningful opinion could be formed (*specify*):
see separate sheet

☐ the claims, or said claims Nos. are so inadequately supported by the description that no meaningful opinion

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/GB00/02168

could be formed.

☐ no international search report has been established for the said claims Nos. .

2. A meaningful international preliminary examination cannot be carried out due to the failure of the nucleotide and/or amino acid sequence listing to comply with the standard provided for in Annex C of the Administrative Instructions:

☐ the written form has not been furnished or does not comply with the standard.

☐ the computer readable form has not been furnished or does not comply with the standard.

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes: Claims 1-41
	No: Claims
Inventive step (IS)	Yes: Claims 2, 26
	No: Claims 1, 3-25, 27-41
Industrial applicability (IA)	Yes: Claims 1-41
	No: Claims

2. Citations and explanations
see separate sheet

VI. Certain documents cited

1. Certain published documents (Rule 70.10)

and / or

2. Non-written disclosures (Rule 70.9)

see separate sheet

VII. Certain defects in the international application

The following defects in the form or contents of the international application have been noted:
see separate sheet

VIII. Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:
see separate sheet

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/GB00/02168

Re Item II

Priority

The priority of the feature "range from 25GHz to 100THz" of independent claims 1 and 25 and of dependent claim 30 is not valid. This feature is, however, not regarded as containing inventive-subject-matter.

The priority of dependent claims 2-5 and 26-29 seems not to be valid since no basis could be found in both priority documents GB 99 130 89.0 and GB 99 134 29.8.

Re Item III

Non-establishment of opinion with regard to novelty, inventive step and industrial applicability

Severe Lack of Clarity of claims 42 and 43; Article 6 PCT

The application does not meet the requirements of Article 6 PCT, because claims 42 and 43 do not contain any technical features and are thus not clear.

It is, therefore, not possible to examine these claims.

Re Item V

Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

Prior Art Documents

The following document cited in the search report is referred to in this communication:

- D1: IEEE J. Selected Topics in Quantum Electronics **2 (3)**, 679-692 (Sept. 1996).
D2: EP-A-0 828 143

Lack of Inventive Step of independent claims 1 and 25; Article 33(3) PCT

The present application does not meet the requirements of Article 33(3) PCT because the subject-matter of independent claims 1 and 25 does not involve an inventive step in the sense of Rule 65 PCT:

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/GB00/02168

Document **D2** discloses methods and arrangements allowing terahertz optical imaging by using either transmission (see e. g. col. 9, l. 58 - col. 10, l. 50 and fig. 4b or col. 11, l. 7-31 and fig. 5a) or reflection (see e. g. col. 10, l. 51 - col. 11, l. 6 and fig. 4c or col. 11, l. 32-48 and fig. 5b) measurements.

Independent claims 1 and 25 differ from this disclosure in that they comprise "means for detecting radiation which is both transmitted through and reflected from the sample".

The problem to be solved by the present invention may therefore be regarded as how to provide "an improved Tera-Hertz imaging system."

Document **D2** mentions that the reflective arrangement of fig. 4c "can also be configured for transmissive analysis" (see col. 11, lines 2-6). In order to improve the embodiments of **D2**, a skilled person would thus try to create a system allowing both types of measurements without needing to change the configuration of the arrangement. It would be obvious to him that the use of a second detector in the embodiments of fig. 4c or of fig. 5b for detecting transmitted radiation would solve his problem. He would thus end up with a method and an apparatus as claimed in claims 1 and 25.

Claims 1 and 25 can thus not be regarded as involving an inventive step as required by Article 33(3) and Rule 65 PCT.

Alternative argumentation

Document **D1** discloses methods and arrangements allowing either transmission (see e. g. page 680 and fig. 2) or reflection (see e. g. page 685 and fig. 9) measurements for sample imaging.

Independent claims 1 and 25 differ from this disclosure in that they comprise "means for detecting radiation which is both transmitted through and reflected from the sample".

The problem to be solved by the present invention may therefore be regarded as how to provide "an improved Tera-Hertz imaging system."

Document **D2** mentions that the reflective arrangement of fig. 4c "can also be configured for transmissive analysis" (see col. 11, lines 2-6). In order to improve the embodiments of **D1**, a skilled person would thus try to create a system allowing both types of measurements without needing to change the configuration of the

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/GB00/02168

arrangement. It would be obvious to him that the inclusion of a second detector for detecting transmitted radiation in the embodiment of fig. 9 would solve his problem. He would thus end up with a method and an apparatus as claimed in claims 1 and 25.

Lack of Inventive Step of dependent Claims 3-24 and 27-41; Article 33(3) PCT

These dependent claims do not appear to contain any additional features which, in combination with the features of any claim to which they refer, meet the requirements of inventive step in the sense of Article 33(3) and Rule 65 PCT: these claims seem to contain merely features being well-known in the art of Tera-Hertz imaging.

Dependent claims 2 and 26 contain inventive subject-matter; Art. 33(2, 3) PCT
Technical Field: Tera-Hertz imaging.

Closest Prior Art: **D1 and D2** disclose Tera-Hertz imaging systems for either reflection or transmission measurements.

Novelty: the present application according to dependent claims 2 and 26 contains the following different feature with respect to the above mentioned prior art: calculation of the time-of-flight of both reflected and transmitted pulses and plotting the difference or function of the difference of the time-of-flight of the transmitted pulse relative to the time-of-flight of the reflected pulse.

The subject-matter of dependent claims 2 and 26 is thus new; Art. 33(2) PCT.

Technical Problem: The technical problem solved by the invention can be seen in "how to obtain shape information of the sample?".

Inventive Step

This technical problem has been solved by the above-mentioned differences.

Neither this solution nor a similar solution is known from prior art: neither documents **D1** and **D2** nor the **intermediate document** mentioned under Re Item VI do contain such a solution or give indications to use such a solution.

Thus, dependent claims 2 and 26 are considered as involving an inventive step; Article 33(3) PCT.

No amendments were made during the PCT-II phase; Article 34(2)b)

R It m VI

Certain documents cited

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/GB00/02168

Certain published documents (Rule 70.10)

The following intermediate document has been discovered during the search. Although it is not being considered as being state of the art in the sense of Article 33(2,3) PCT because it was published after the filing date of the present application, it may become relevant during the national phase in certain contracting states because the priority of some of the dependent claims is not valid (see Re Item II):

Application No Patent No	Publication date (day/month/year)	Filing date (day/month/year)	Priority date (valid claim) (day/month/year)
UK-A-2 347 835	13.09.2000	04.06.1999	23.02.1999

Re Item VII

Certain defects in the international application

Independent claims 1 and 25 are not in the two-part form, which in the present case would be appropriate, with those features known in combination from the prior art being placed in the preamble and with the remaining features being included in the characterising part; Rule 6.3 b) PCT and PCT Guidelines III-2.2 and 2.3.

The claims do not contain reference signs in parentheses; Rule 6.2 b) PCT.

Re Item VIII

Certain observations on the international application

Lack of Clarity; Article 6 PCT

The application does not meet the requirements of Article 6 PCT because of the following clarity objections:

Claims 1 and 25: it is not clear which arrangement is used for the measurements, e. g. whether one or two detectors are used. It further remains unclear how and based on which data (reflection, transmission or both) the image is generated.

Claims 3 and 27: it is not clear how the mentioned technical effect is obtained?

Claim 4: "known separation"; unclear.

Claims 6, 8 and 31: the technical features necessary to obtain the small beam diameter

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/GB00/02168

should have been mentioned (see page 15).

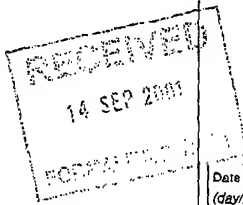
Claim 14: obscure.

Claims 25-41: the expression "for ..." does not give any information about the constructional relationship between the different components. It should probably have been replaced by "arranged to ...".

From the
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

To:

GRANLEESE, Rhian Jane
MARKS & CLEHK
57-60 Lincoln's Inn Fields
London WC2A 3LS
GRANDE BRETAGNE



PCT

NOTIFICATION OF TRANSMITTAL OF
THE INTERNATIONAL PRELIMINARY
EXAMINATION REPORT

(PCT Rule 71.1)

Date of mailing
(day/month/year) 12.09.2001

Applicant's or agent's file reference
WPP80799

IMPORTANT NOTIFICATION

International application No.
PCT/GB00/02168

International filing date (day/month/year)
05/06/2000

Priority date (day/month/year)
04/06/1999

Applicant
TERAPROBE LIMITED et al.

1. The applicant is hereby notified that this International Preliminary Examining Authority transmits herewith the international preliminary examination report and its annexes, if any, established on the international application.

2. A copy of the report and its annexes, if any, is being transmitted to the International Bureau for communication to all the elected Offices.

3. Where required by any of the elected Offices, the International Bureau will prepare an English translation of the report (but not of any annexes) and will transmit such translation to those Offices.

4. REMINDER

The applicant must enter the national phase before each elected Office by performing certain acts (filing translations and paying national fees) within 30 months from the priority date (or later in some Offices) (Article 39(1)) (see also the reminder sent by the International Bureau with Form PCT/IR/301).

Where a translation of the international application must be furnished to an elected Office, that translation must contain a translation of any annexes to the international preliminary examination report. It is the applicant's responsibility to prepare and furnish such translation directly to each elected Office concerned.

For further details on the applicable time limits and requirements of the elected Offices, see Volume II of the PCT Applicant's Guide.

Name and mailing address of the IPEA/

European Patent Office
Ch-80296 Munich
Tel. +49 89 2399 - 0 Tx: 523656 epmu d
Fax: +49 89 2399 - 4465

Authorized officer

Conner, M

Tel. +49 89 2399-2241




PATENT COOPERATION TREA

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference WPP80799		FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No PCT/GB00/02168	International filing date (day/month/year) 05/06/2000	Priority date (day/month/year) 04/06/1999	
International Patent Classification (IPC) or national classification and IPC G01N21/35			
Applicant TERAPROBE LIMITED et al.			
<p>1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of 9 sheets, including this cover sheet.</p> <p><input type="checkbox"/> This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).</p> <p>These annexes consist of a total of sheets.</p>			
<p>3. This report contains indications relating to the following items:</p> <ul style="list-style-type: none"> I <input checked="" type="checkbox"/> Basis of the report II <input checked="" type="checkbox"/> Priority III <input type="checkbox"/> Non-establishment of opinion with regard to novelty, inventive step and industrial applicability IV <input type="checkbox"/> Lack of unity of invention V <input checked="" type="checkbox"/> Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement VI <input checked="" type="checkbox"/> Certain documents cited VII <input checked="" type="checkbox"/> Certain defects in the international application VIII <input checked="" type="checkbox"/> Certain observations on the international application 			
Date of submission of the demand 03/01/2001		Date of completion of this report 12.08.2001	
Name and mailing address of the international preliminary examining authority:  European Patent Office D-80293 Munich Tel. +49 89 2399 - 0 1x; 523656 epmu d Fax: +49 89 2399 - 4455		Authorized officer Feldhoff, P Telephonic No. +40 89 2399 2186	



**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**International application No. **PCT/GB00/02168****I. Basis of the report**

1. With regard to the elements of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17):*)
Description, pages:

1-30 as originally filed

Claims, No.:

1-43 as originally filed

Drawings, sheets:

1/12 12/12 as originally filed

2. With regard to the language, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
☐ the language of publication of the international application (under Rule 48.3(b)).
☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
☐ filed together with the international application in computer readable form.
☐ furnished subsequently to this Authority in written form.
☐ furnished subsequently to this Authority in computer readable form.
☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
☐ the claims, Nos.:

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**International application No. **PCT/GB00/02168**☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

II. Priority

1. ☐ This report has been established as if no priority had been claimed due to the failure to furnish within the prescribed time limit the requested:

☐ copy of the earlier application whose priority has been claimed.

☐ translation of the earlier application whose priority has been claimed.

2. ☒ This report has been established as if no priority had been claimed due to the fact that the priority claim has been found invalid.

Thus for the purposes of this report, the international filing date indicated above is considered to be the relevant date.

3. Additional observations, if necessary:

III. Non-establishment of opinion with regard to novelty, inventive step and industrial applicability

1. The questions whether the claimed invention appears to be novel, to involve an inventive step (to be non-obvious), or to be industrially applicable have not been examined in respect of:

☐ the entire international application.

☒ claims Nos. 42, 43.

because:

☐ the said international application, or the said claims Nos. relate to the following subject matter which does not require an international preliminary examination (*specify*):

☒ the description, claims or drawings (*indicate particular elements below*) or said claims Nos. 42, 43 are so unclear that no meaningful opinion could be formed (*specify*):
see separate sheet

☐ the claims, or said claims Nos. are so inadequately supported by the description that no meaningful opinion

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**International application No. **PCT/GB00/02168**

could be formed.

☐ no international search report has been established for the said claims Nos. .

2. A meaningful international preliminary examination cannot be carried out due to the failure of the nucleotide and/or amino acid sequence listing to comply with the standard provided for in Annex C of the Administrative Instructions:

☐ the written form has not been furnished or does not comply with the standard.

☐ the computer readable form has not been furnished or does not comply with the standard.

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes: Claims 1-41
	No: Claims
Inventive step (IS)	Yes: Claims 2, 26
	No: Claims 1, 3-25, 27-41
Industrial applicability (IA)	Yes: Claims 1-41
	No: Claims

**2. Citations and explanations
see separate sheet**

VI. Certain documents cited

1. Certain published documents (Rule 70.10)

and / or

2. Non-written disclosures (Rule 70.9)

see separate sheet

VII. Certain defects in the international application

The following defects in the form or contents of the international application have been noted:
see separate sheet

VIII. Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:
see separate sheet

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/GB00/02168

Re Item II**Priority**

The priority of the feature "range from 25GHz to 100THz" of Independent claims 1 and 25 and of dependent claim 30 is not valid. This feature is, however, not regarded as containing inventive-subject-matter.

The priority of dependent claims 2-5 and 26-29 seems not to be valid since no basis could be found in both priority documents GB 99 130 89.0 and GB 99 134 29.8.

Re Item III

Non-establishment of opinion with regard to novelty, inventive step and industrial applicability

Severe Lack of Clarity of claims 42 and 43; Article 6 PCT

The application does not meet the requirements of Article 6 PCT, because claims 42 and 43 do not contain any technical features and are thus not clear.

It is, therefore, not possible to examine these claims.

Re Item V

Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

Prior Art Documents

The following document cited in the search report is referred to in this communication:

D1: IEEE J. Selected Topics in Quantum Electronics 2 (3), 679-692 (Sept. 1996).

D2: EP-A-0 828 143

Lack of Inventive Step of independent claims 1 and 25; Article 33(3) PCT

The present application does not meet the requirements of Article 33(3) PCT because the subject-matter of independent claims 1 and 25 does not involve an inventive step in the sense of Rule 65 PCT:

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Document **D2** discloses methods and arrangements allowing terahertz optical imaging by using either transmission (see e. g. col. 9, l. 58 - col. 10, l. 50 and fig. 4b or col. 11, l. 7-31 and fig. 5a) or reflection (see e. g. col. 10, l. 51 - col. 11, l. 6 and fig. 4c or col. 11, l. 32-48 and fig. 5b) measurements.

Independent claims 1 and 25 differ from this disclosure in that they comprise "means for detecting radiation which is both transmitted through and reflected from the sample".

The problem to be solved by the present invention may therefore be regarded as how to provide "an improved Tera-Hertz imaging system."

Document **D2** mentions that the reflective arrangement of fig. 4c "can also be configured for transmissive analysis" (see col. 11, lines 2-6). In order to improve the embodiments of **D2**, a skilled person would thus try to create a system allowing both types of measurements without needing to change the configuration of the arrangement. It would be obvious to him that the use of a second detector in the embodiments of fig. 4c or of fig. 5b for detecting transmitted radiation would solve his problem. He would thus end up with a method and an apparatus as claimed in claims 1 and 25.

Claims 1 and 25 can thus not be regarded as involving an inventive step as required by Article 33(3) and Rule 65 PCT.

Alternative argumentation

Document **D1** discloses methods and arrangements allowing either transmission (see e. g. page 680 and fig. 2) or reflection (see e. g. page 685 and fig. 9) measurements for sample imaging.

Independent claims 1 and 25 differ from this disclosure in that they comprise "means for detecting radiation which is both transmitted through and reflected from the sample".

The problem to be solved by the present invention may therefore be regarded as how to provide "an improved Tera-Hertz imaging system."

Document **D2** mentions that the reflective arrangement of fig. 4c "can also be configured for transmissive analysis" (see col. 11, lines 2-6). In order to improve the embodiments of **D1**, a skilled person would thus try to create a system allowing both types of measurements without needing to change the configuration of the

**INTERNATIONAL PRELIMINARY
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International application No. PCT/GB00/02168

arrangement. It would be obvious to him that the inclusion of a second detector for detecting transmitted radiation in the embodiment of fig. 9 would solve his problem. He would thus end up with a method and an apparatus as claimed in claims 1 and 25.

Lack of Inventive Step of dependent Claims 3-24 and 27-41; Article 33(3) PCT

These dependent claims do not appear to contain any additional features which, in combination with the features of any claim to which they refer, meet the requirements of inventive step in the sense of Article 33(3) and Rule 65 PCT: these claims seem to contain merely features being well-known in the art of Tera-Hertz imaging.

Dependent claims 2 and 26 contain inventive subject-matter; Art. 33(2, 3) PCT

Technical Field: Tera-Hertz imaging.

Closest Prior Art: D1 and D2 disclose Tera-Hertz imaging systems for either reflection or transmission measurements.

Novelty: the present application according to dependent claims 2 and 26 contains the following different feature with respect to the above mentioned prior art: calculation of the time-of-flight of both reflected and transmitted pulses and plotting the difference or function of the difference of the time-of-flight of the transmitted pulse relative to the time-of-flight of the reflected pulse.

The subject-matter of dependent claims 2 and 26 is thus new; Art. 33(2) PCT.

Technical Problem: The technical problem solved by the invention can be seen in "how to obtain shape information of the sample?".

Inventive Step

This technical problem has been solved by the above-mentioned differences.

Neither this solution nor a similar solution is known from prior art: neither documents D1 and D2 nor the intermediate document mentioned under Re Item VI do contain such a solution or give indications to use such a solution.

Thus, dependent claims 2 and 26 are considered as involving an inventive step; Article 33(3) PCT.

No amendments were made during the PCT-II phase; Article 34(2)b)

Re Item VI

Certain documents cited

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EXAMINATION REPORT - SEPARATE SHEET**

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Certain published documents (Rule 70.10)

The following intermediate document has been discovered during the search. Although it is not being considered as being state of the art in the sense of Article 33(2.3) PCT because it was published after the filing date of the present application, it may become relevant during the national phase in certain contracting states because the priority of some of the dependent claims is not valid (see Re Item II):

Application No Patent No	Publication date (day/month/year)	Filing date (day/month/year)	Priority date (valid claim) (day/month/year)
UK-A-2 347 835	13.09.2000	04.06.1999	23.02.1999

Re Item VII

Certain defects in the international application

Independent claims 1 and 25 are not in the two-part form, which in the present case would be appropriate, with those features known in combination from the prior art being placed in the preamble and with the remaining features being included in the characterising part; Rule 6.3 b) PCT and PCT Guidelines III-2.2 and 2.3.

The claims do not contain reference signs in parentheses; Rule 6.2 b) PCT.

Re Item VIII

Certain observations on the international application

Lack of Clarity; Article 6 PCT

The application does not meet the requirements of Article 6 PCT because of the following clarity objections:

Claims 1 and 25: it is not clear which arrangement is used for the measurements, e. g. whether one or two detectors are used. It further remains unclear how and based on which data (reflection, transmission or both) the image is generated.

Claims 3 and 27: it is not clear how the mentioned technical effect is obtained?

Claim 4: "known separation"; unclear.

Claims 6, 8 and 31: the technical features necessary to obtain the small beam diameter

INTERNATIONAL PRELIMINARY International application No. **PCT/GB00/02168**
EXAMINATION REPORT - SEPARATE SHEET

should have been mentioned (see page 15).

Claim 14: obscure.

Claims 25-41: the expression "for ..." does not give any information about the constructional relationship between the different components. It should probably have been replaced by "arranged to ...".

PATENT COOPERATION TREATY

PCT

NOTIFICATION OF THE RECORDING OF A CHANGE

(PCT Rule 92bis.1 and
Administrative Instructions, Section 422)

From the INTERNATIONAL BUREAU

To:

GRANLEESE, Rhian, Jane
Marks & Clerk
57-60 Lincoln's Inn Fields
London WC2A 3LS
ROYAUME-UNI

Date of mailing (day/month/year) 03 December 2001 (03.12.01)	IMPORTANT NOTIFICATION International filing date (day/month/year) 05 June 2000 (05.06.00)
Applicant's or agent's file reference WPP80799	
International application No. PCT/GB00/02168	

1. The following indications appeared on record concerning: <input checked="" type="checkbox"/> the applicant <input type="checkbox"/> the inventor <input type="checkbox"/> the agent <input type="checkbox"/> the common representative		
Name and Address TERAVIEW LIMITED 260 Cambridge Science Park Milton Road Cambridge CB4 0WE United Kingdom	State of Nationality GB	State of Residence GB
	Telephone No.	
	Facsimile No.	
	Teleprinter No.	
2. The International Bureau hereby notifies the applicant that the following change has been recorded concerning: <input type="checkbox"/> the person <input type="checkbox"/> the name <input checked="" type="checkbox"/> the address <input type="checkbox"/> the nationality <input type="checkbox"/> the residence		
Name and Address TERAVIEW LIMITED 302/304 Cambridge Science Park Milton Road Cambridge CB4 0WG United Kingdom	State of Nationality GB	State of Residence GB
	Telephone No.	
	Facsimile No.	
	Teleprinter No.	
3. Further observations, if necessary:		
4. A copy of this notification has been sent to: <input checked="" type="checkbox"/> the receiving Office <input type="checkbox"/> the designated Offices concerned <input type="checkbox"/> the International Searching Authority <input checked="" type="checkbox"/> the elected Offices concerned <input checked="" type="checkbox"/> the International Preliminary Examining Authority <input type="checkbox"/> other:		

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland Facsimile No.: (41-22) 740.14.35	Authorized officer Agnes WITTMANN-REGIS Telephone No.: (41-22) 338.83.38
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PATENT COOPERATION TREATY

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NOTIFICATION OF THE RECORDING
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From the INTERNATIONAL BUREAU

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Applicant's or agent's file reference WPP80799	
International application No. PCT/GB00/02168	International filing date (day/month/year) 05 June 2000 (05.06.00)

1. The following indications appeared on record concerning:

☒ the applicant
 ☐ the inventor
 ☐ the agent
 ☐ the common representative

Name and Address TERAPROBE LIMITED Five Chancery Lane London EC4A 1BU United Kingdom	State of Nationality GB	State of Residence GB
	Telephone No.	
	Facsimile No.	
	Teleprinter No.	

2. The International Bureau hereby notifies the applicant that the following change has been recorded concerning:

☒ the person
 ☐ the name
 ☐ the address
 ☐ the nationality
 ☐ the residence

Name and Address TERAVIEW LIMITED 260 Cambridge Science Park Milton Road Cambridge CB4 0WE United Kingdom	State of Nationality GB	State of Residence GB
	Telephone No.	
	Facsimile No.	
	Teleprinter No.	

3. Further observations, if necessary:

Assignment of international application has been recorded.

4. A copy of this notification has been sent to:

<input checked="" type="checkbox"/> the receiving Office	<input type="checkbox"/> the designated Offices concerned
<input type="checkbox"/> the International Searching Authority	<input checked="" type="checkbox"/> the elected Offices concerned
<input checked="" type="checkbox"/> the International Preliminary Examining Authority	<input type="checkbox"/> other:

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland Facsimile No.: (41-22) 740.14.35	Authorized officer Agnes WITTMANN-REGIS Telephone No.: (41-22) 338.83.38
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PATENT COOPERATION TREATY

PCT

NOTIFICATION OF ELECTION

(PCT Rule 61.2)

From the INTERNATIONAL BUREAU

To:

Commissioner
 US Department of Commerce
 United States Patent and Trademark
 Office, PCT
 2011 South Clark Place Room
 CP2/5C24
 Arlington, VA 22202
 ETATS-UNIS D'AMERIQUE
 in its capacity as elected Office

Date of mailing (day/month/year) 08 February 2001 (08.02.01)	
International application No. PCT/GB00/02168	Applicant's or agent's file reference WPP80799
International filing date (day/month/year) 05 June 2000 (05.06.00)	Priority date (day/month/year) 04 June 1999 (04.06.99)
Applicant ARNONE, Donald, Dominic et al	

1. The designated Office is hereby notified of its election made:

☒ in the demand filed with the International Preliminary Examining Authority on:

03 January 2001 (03.01.01)

☐ in a notice effecting later election filed with the International Bureau on:2. The election ☒ was☐ was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland Facsimile No.: (41-22) 740.14.35	Authorized officer Juan Cruz Telephone No.: (41-22) 338.83.38
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PATENT COOPERATION TREATY

PCT

NOTIFICATION OF THE RECORDING
OF A CHANGE(PCT Rule 92bis.1 and
Administrative Instructions, Section 422)

From the INTERNATIONAL BUREAU

To:

GRANLEESE, Rhian, Jane
Marks & Clerk
57-60 Lincoln's Inn Fields
London WC2A 3LS
ROYAUME-UNI

Date of mailing (day/month/year) 04 juillet 2001 (04.07.01)	IMPORTANT NOTIFICATION
Applicant's or agent's file reference WPP80799	
International application No. PCT/GB00/02168	International filing date (day/month/year) 05 juin 2000 (05.06.00)

1. The following indications appeared on record concerning:		
<input checked="" type="checkbox"/> the applicant	<input type="checkbox"/> the inventor	<input type="checkbox"/> the agent <input type="checkbox"/> the common representative
Name and Address TOSHIBA RESEARCH EUROPE LIMITED Cambridge Research Laboratory 260 Cambridge Science Park Milton Road Cambridge Cambridgeshire CB4 0WE United Kingdom	State of Nationality GB	State of Residence GB
	Telephone No.	
	Facsimile No.	
	Teleprinter No.	
2. The International Bureau hereby notifies the applicant that the following change has been recorded concerning:		
<input checked="" type="checkbox"/> the person	<input checked="" type="checkbox"/> the name	<input checked="" type="checkbox"/> the address <input type="checkbox"/> the nationality <input type="checkbox"/> the residence
Name and Address TERAPROBE LIMITED Five Chancery Lane London EC4A 1BU United Kingdom	State of Nationality GB	State of Residence GB
	Telephone No.	
	Facsimile No.	
	Teleprinter No.	
3. Further observations, if necessary:		
4. A copy of this notification has been sent to:		
<input checked="" type="checkbox"/> the receiving Office	<input type="checkbox"/> the designated Offices concerned	
<input type="checkbox"/> the International Searching Authority	<input checked="" type="checkbox"/> the elected Offices concerned	
<input checked="" type="checkbox"/> the International Preliminary Examining Authority	<input type="checkbox"/> other:	

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland	Authorized officer Dominique DELMAS
Facsimile No.: (41-22) 740.14.35	Telephone No.: (41-22) 338.83.38

(19) World Intellectual Property Organization
International Bureau



FOR MORE INFORMATION ON THE PCT SYSTEM, SEE THE PCT HANDBOOK, WHICH IS AVAILABLE FROM THE WORLD INTELLECTUAL PROPERTY ORGANIZATION

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(71) Applicant (for all designated States except US):
TOSHIBA RESEARCH EUROPE LIMITED [GB/GB];
Cambridge Research Laboratory, 260 Cambridge Science
Park, Milton Road, Cambridge, Cambridgeshire CB4 0WE
(GB).

(72) Inventors; and

(75) Inventors/Applicants (for US only): ARNONE, Donald,
Dominic [GB/GB]; Toshiba Research Europe Limited,

Cambridge Research Laboratory, 260 Cambridge Science
Park, Milton Road, Cambridge CB4 0WE (GB). CIESLA,
Craig, Michael [GB/GB]; Toshiba Research Europe
Limited, Cambridge Research Laboratory, 260 Cambridge
Science Park, Milton Road, Cambridge CB4 0WE (GB).

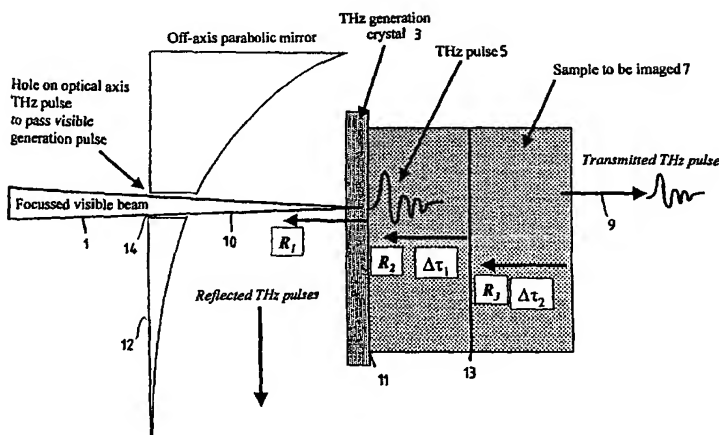
(74) Agent: GRANLEESE, Rhian, Jane; Marks & Clerk,
57-60 Lincoln's Inn Fields, London WC2A 3LS (GB).

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DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU,
ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS,
LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO,
NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR,
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IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG,
CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

[Continued on next page]

(54) Title: THREE DIMENSIONAL IMAGING



(57) Abstract: A method and apparatus for imaging a sample, the method comprising the steps of: a) irradiating a sample to be imaged with a beam of pulsed electromagnetic radiation with a plurality of frequencies in the range from 25 GHz to 100 THz; b) detecting radiation which is both transmitted through and reflected from the sample; and c) generating an image of the sample from radiation detected in step (b). The method and apparatus can be used to generate a three-dimensional image of the sample and/or a compositional image of the sample.

